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Comment on "Microdosimetry and Katz's Track Structure Theory" by Marco Zaider

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LETTER TO THE EDITOR

Comment on "Microdosimetry and Katz's Track Structure Theory" by Marco Zaider [*Radiat. Res.* **124,** S16-S22 (1990)]

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To test radiobiological models one needs data from X- or γ-ray and HZE track segment irradiations of the widest possible dynamic range in dose, LET, end points, and test objects (enzymes, viruses, bacteria, cells, tissues, organs, and organisms). Some data are currently available. There are excellent data on the inactivation of dry enzymes and viruses which should serve as a test of every biophysical model. On many occasions Zaider has asserted the superiority of microdosimetric over track structure models, asserting that "radial dose distributions (on which track structure theory is based) are generally poor substitutes for exact microdosimetric distributions." I have repeatedly challenged that view, asking that he demonstrate the claimed superiority by using microdosimetric theory to calculate the inactivation cross sections for dry enzymes and viruses. I predicted failure, for I believe that microdosimetric models lack relevance, and that relevance takes priority over accuracy. We agreed that he would publish his results, even in the event of failure. It is to his credit that he has done so, and in the referenced paper he demonstrates that his calculations do not agree with experimental cross sections found for ϕx-174 viruses.

The paper goes on to explain why the Katz model for a one-hit detector is incorrect, in a manner I find obscure. But the proof of the pudding is in the eating. Surely if Zaider has a better model, its superiority can be demonstrated by further calculations. There are the enzyme data of Brustad that should be addressed as a first order of business. There is an abundance of other data on the response of one-hit detectors and biological cells that have been fitted by track theory that we can place on the agenda at a later time.

I hope he will accept this challenge. Once again I predict failure. The failure will come not as a result of lack of "information about the target (shape, size, composition) as well as the corresponding microdosimetric spectra" but because of conceptual problems in the microdosimetric approach. Track theory also lacks this information and succeeds.

We must evaluate the validity of models by comparison with experiment rather than by elaborate. but often obscure, mathematical analyses. I have been told that models that agree with data are not necessarily right, but surely the failure to agree with data is not a recommendation.